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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
MINEHIRO TONOSAKI, ET AL.	: EXAMINER: LEO, L.
SERIAL NO: 10/728,916	:
FILED: DECEMBER 8, 2003	: GROUP ART UNIT: 3744
FOR: HEAT-TRANSPORT DEVICE, METHOD FOR MANUFACTURING THE SAME, AND ELECTRONIC DEVICE	:

APPEAL BRIEF UNDER 37 C.F.R. §41.37

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Responsive to the Final Office Action dated February 5, 2008 and the Advisory Action of May 9, 2008, Applicants request review of the rejections in the above-identified application by the Board of Patent Appeals and Interferences.

I. REAL PARTY IN INTEREST

The real party in interest is Sony Corporation of Japan.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF THE CLAIMS

Claims 11-12, 14-18, 20-22, 25-32, 34, 36-54 are pending in the application. Claims 1-10, 13, 19, 23-24, 33 and 35 are canceled claims. Claims 17-18, 20-22, 26, 28, 30, 34, 37,

39, 41-43, 45-47, 50, 52 and 54 are currently withdrawn from prosecution. The rejection of Claims 11-12, 14-16, 25, 27, 29, 31-32, 36, 38, 40, 44, 48-49, 51 and 53 is appealed.

IV. STATUS OF THE AMENDMENTS

The Amendment filed on April 4, 2008 was entered and considered (see paragraph no. 7 of the Advisory Action of May 9, 2008).

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Independent Claim 11 is drawn to a micro heat-transport device that comprises (i) a refrigerant, (ii) an evaporator, (iii) a condenser, (iv) a liquid passage "linking the evaporator and condenser configured to allow the refrigerant to flow from the condenser to the evaporator", (v) a gas passage linking the evaporator and condenser, and (vi) a wick. The liquid and gas passages are shown in Figure 1. The wick is described in the paragraph bridging pages 6 and 7 of the specification. The refrigerant includes the working fluids disclosed on page 7, third full paragraph. The evaporator and condenser are disclosed in the first full paragraph on page 6. The wick of the micro heat-transport device is covered with a stable material described in the specification on page 8, first full paragraph; page 8, second full paragraph; and page 9, last full paragraph.

Claim 25 requires that the wick of the heat micro heat-transport device is ion implanted. Ion implantation is described on page 13, second and third full paragraphs.

Claim 27 requires that the wick have a particular form such as grooves. The grooves of the invention are disclosed on page 7, fourth full paragraph; page 9, first full paragraph; page 10 in the description of Figure 3, in Figure 3; and in the last full paragraph on page 12.

Claim 32 requires the presence of the stable material between the glass and the refrigerant. The advantages provided by the stable material are disclosed on page 8, second full paragraph.

Claim 36 recites a stable material formed by chemical vapor deposition such as that described in the paragraph bridging pages 13 and 14.

Claims 49 and 51 define dimensional characteristics of the condenser and the wick in microns. The dimensional characteristics of components of the claimed micro heat-transport device are described in the first full paragraph on page 9.

Claim 53 recites that the stable material "consists of" SiO_2. This stable material is described in the paragraph bridging pages 13 and 14.

VI. GROUNDS OF REJECTION

A-B. Claims 11-12, 14-16, 25, 27, 29, 31-32, 36, 38, 40, 44, 48-49, 51 and 53 are rejected as obvious under the meaning 37 U.S.C. §103(a) over Kirshberg (U.S. 2003/0066625) in combination with Steele (U.S. 5,562,949) or Uchida (U.S. 5,943,543) (see pages 3-5 of the Office Action of February 5, 2008)

The Office asserts that the combination of Kirshberg with Steele or Uchida renders the claimed invention obvious. The Office acknowledges that the primary reference, Kirshberg, does not disclose all of the features of the present claims (e.g., a silicon dioxide coating – see page 3 of the February 5, 2008 Office Action). The Office relies on Steele or Uchida as evidence that one of ordinary skill in the art would use the hydrophilic coating disclosed in Steele or Uchida (e.g., silicon dioxide) in the device of Kirshberg to arrive at the presently claimed invention.

C. Claims 11-12, 14-16, 25, 27, 29, 31-32, 36, 38, 40, 44, 48-49, 51 and 53 are rejected for failing to comply with the written description requirement under the meaning 35 U.S.C. §112, first paragraph (see pages 2 and 3 of the February 5, 2008 Office Action)

The Office asserts that the recitation in present independent Claim 1 of "a first glass and a first substrate" and "a second glass and a second substrate" is not adequately described in the original specification.

VII. ARGUMENT

A. Rejection under 35 U.S.C. §103(a) over Kirshberg in Combination with Uchida.

Claim 11 is drawn to a micro heat-transport device. The Office asserts that the claimed micro heat-transport device is obvious over Kirshberg in combination with Uchida. The Office acknowledges that the primary reference, Kirshberg "does not disclose a silicon dioxide coating" (see the last sentence of page 3 of the February 5, 2008 Office Action).

Kirshberg describes a MEMS micro capillary pumped loop for chip-level temperature control (see the title of Kirshberg). The Office relies on Figure 2 as evidence that Kirshberg discloses a heat-transport device comprising the glass, substrate, evaporator, condenser, liquid passage, vapor passage and wick recited in present Claim 11. Figure 2 of Kirshberg provides dimensions of the Kirshberg micro capillary pumped loop in microns, e.g., the dimensions of the condenser are 1,000 μm x 50 μm x 150 μm.

Uchida discloses a heat transmitting member and a method of manufacturing the same (see the title of Uchida). The Uchida heat transmitting member is described in the abstract of the reference as follows (underlining added):

> This invention provides a heat transmitting pipe and a heat transmitting plate which are capable of greatly improving the heat transfer efficiency of a conventional finned heating pipe and a conventional heating plate.

The Office asserts that Uchida discloses a heat exchanger comprising a heat transfer surface having a hydrophilic coating of silicon dioxide which improves wetting and wicking properties and hence provides improved heat transfer (see the first paragraph on page 4 of the February 5 Office Action). The Office did not provide a column and line number citation to the cited art to support this assertion.

Present independent Claim 11 requires that at least one of the glasses and/or one of the substrates is covered with a stable material (e.g., SiO_2). The Office is of the opinion that those of skill in the art would use the coating of the Uchida heat transfer surface (e.g., silicon dioxide - SiO_2) in the device of Kirshberg. At the outset Appellants note that heat exchanger of Uchida is substantially different from the micro heat-transport of the presently claimed invention.

Uchida discloses the following with respect to the inclusion of a heat transfer surface in devices described in the cited art (underlining added):

> The present invention is intended to solve the problems as stated above. It has for its object to provide a heat transmitting member in which the body thereof such as a metal plate or metal pipe of high thermal conduction is overlaid with a porous metal material having a large surface area and a high percentage of voids per unit volume, and a continuous and complete method of manufacturing the heat transmitting member.

See column 1, lines 60-67 of Uchida.

Uchida discloses covering a metallic material with a hydrophilic coating. The Office appears to be of the belief that this disclosure would motivate one of ordinary skill in the art to cover the glass or the substrate of the presently claimed micro heat-transport device with a coating of SiO_2. However, the Office failed to provide any explanation why one of ordinary skill in the art designing the micro heat-transport device of the presently claimed invention (i.e., a micro heat-transport device having a glass and a substrate) would rely on Uchida's disclosure of a coated metallic material as inspiration for the presently claimed invention.

Claim 32 of the present application requires that the stable material (e.g., SiO_2) is between the glass and the refrigerant, the Office provided no explanation why one of ordinary skill in the art would be motivated to cover glass with the hydrophilic coating of Uchida in vie of Uchida's limited disclosure of coated metallic material. Appellants submit that it is readily recognizable that glass and metal are substantially different materials and that one is not necessarily obvious over the other.

Moreover, Uchida expressly discloses that the silicon dioxide is used as a hydrophilic coating because of its ability to cope with corrosion. For example:

> The wettability or the water repellence can be bestowed by, for example, coating the heat transmitting face with a silicate type hydrophilic coating material or a Teflon™ type coating material. When a hydrophilic coating material containing silicon dioxide is applied on the heat transmitting face in order to cope with corrosion, the heat transmitting performance can be improved or maintained on the basis of an enhanced wettability.

See column 7, lines 4-11 of Uchida.

At best, Uchida discloses that silicon dioxide may be used as a coating to "cope with corrosion" one metal, but does not otherwise mention that the silicon dioxide may be used to lessen contaminant bleed into a refrigerant (see present Claim 32).

With regard to dependent Claims 49 and 51, Uchida discloses the use of hydrophilic coatings on conventional devices such as parts of conventional finned heating parts. The Examples of Uchida give an idea of the scale of the Uchida device, for example, copper plates having a thickness of 0.8 mm (column 8, lines 42-43) are disclosed.

Appellants submit it is readily evident that the device of Uchida is not a micro heat-transport device such as that presently claimed. The Office appears to give no consideration to the requirement of the present claims that the heat-transport device is a micro heat-transport device.

Simply changing the scale of the prior art may not be a basis for patentability (see MPEP §2144.04). However, in the present case, changing from a conventionally scaled device to a micro scaled device necessarily involves substantial differences in the principles and fundamental laws which govern heat and fluid flow. The Office appears to believe that one of ordinary skill in the art working in the field of micro heat-transport devices would turn to the teachings of macro (e.g., conventionally scaled) heat-transport devices because such devices operate under the same fundamental conditions of heat and fluid flow.

Appellants submit this is not correct. In fact, an entire field of study is devoted to micro-fluidics. Fluid transport and/or fluid flow occurring on a micro scale is well-recognized to be influenced by factors which play no role or a different role in heat and/or fluid flow occurring on a macro scale. For example, surface tension, energy dissipation, capillary forces, the ability to achieve turbulent flow and fluidic resistance (e.g., non-laminar flow), may each substantially change the rules governing fluid and/or heat flow on a micro scale in comparison to fluid and/or heat flow on a macro (conventional) scale.

Dependent Claims 49 and 51 recite particular micro-scale dimensions for the condenser and the wick, respectively. Appellants submit that there is no reason for one of ordinary skill in the art to expect that the coating descriibed in Uchida could be successfully employed in a micro heat-transport device given that it is widely recognized that factors such as surface tension, energy dissipation, capillary forces, the ability to achieve turbulent flow and fluidic resistance, can change the way fluid and/or heat flow occurs on a macro scale. In the absence of any expectation of success, the Office's assertion of obviousness should not stand and the rejection should be withdrawn.

Appellants submit that the rejection of the present claims as obvious over the combination of Kirshberg and Uchida is not supportable because (i) Uchida discloses the use of an hydrophilic coating on a material that is different from the glass and substrate of the

present claims and (ii) those of skill in the art would have no reason for believing that the structure of a macro heat-transport device could be effectively incorporated in a micro heat-transport device.

B. Rejection Under 35 U.S.C. §103(a) over Kirshberg in Combination with Steele.

The Office appears to have rejected the claims over the combination of Kirshberg and Steele for essentially the same reasons used to reject the claims over the combination of Kirshberg and Uchida; namely, for the reason that one of skill in the art would include Steele's heat transfer surface in the device of Kirshberg to arrive at the presently claimed invention.

The Steele invention is described as follows:

> The present invention therefore relates to a low solids, optionally antimicrobial, hydrophilic coating. The coating, in the form of a slurry (a stage of preparation further described below), comprises: an adhesive agent; an insolubilizer for insolubilizing the adhesive agent; an inorganic compound selected from the group consisting of silica, calcium silicate, and mixtures thereof; optionally, an antimicrobial agent; and water or a water-based solvent, and deposits a material by dip application and cure, less than about 8 mg of cured coating per square inch of coated or dipped material.

See the paragraph bridging columns 2 and 3 of Steele.

Steele further describes the invention of the patent as follows:

> The present invention also relates to a condensing heat exchanger whose heat transfer surfaces are coated with the low solids, optionally antimicrobial, hydrophilic coating described hereinabove.

See column 3, lines 9-12 of Steele.

As was discussed above for the rejection of the claims over the combination of Kirshberg and Uchida, Appellants submit that those of ordinary skill in the art would not rely on the disclosure of Steele as inspiration for making the presently claimed micro heat-

transport device. Steele, like Uchida, discloses the use of hydrophilic coatings on macro size devices. For example, the examples of Steele disclose coatings on test panels having dimensions 2 x 2 x 1/16 **inches** (see column 8, lines 45-46 of Steele). Appellants submit that a device of this size cannot possibly be considered a micro heat-transport device (e.g., a device having functional features scaled in microns).

Appellants draw the Board's attention to dependent Claims 49 and 51 which recite dimensions in microns for certain components of the presently claimed invention (i.e., the condenser and wick, respectively). As was mentioned above in the arguments traversing the rejection of the present claims over Uchida, Appellants submit that those of ordinary skill in the art would not draw on the disclosure of the conventionally sized heat transfer services of Steele to prepare the presently claimed micro heat-transport device.

Not only would those of skill in the art not turn to Steele as inspiration for preparing the heat transport device of the present claims, those of ordinary skill in the art would have no reason to believe that the coating of Steele which is disclosed to be applied to steel test panels would be amenable to covering the glass of the present claims (see the "Sample Preparation" section of the Steele patents in columns 8 and 9).

Further still, the coating of Steele is one that is formed by applying a slurry to a substrate (see the paragraph bridging columns 2 and 3 of Steele). The slurry of Steele contains an inorganic material that is present in the form of particles having a certain particle size:

> It is further preferred that the inorganic compound have an average particle size of from about 6 to about 14 microns, with about 8 to about 10 microns especially preferred. Particle sizes within these ranges increase slurry life, decrease separation of the components of the slurry, and simplify mixing of the slurry.

See column 4, lines 7-13.

Steele further discloses that in order to obtain an acceptable coating, the coating should have a certain thickness (underlining added):

> It has been demonstrated that the thickness of the coating does not affect the hydrophilic and antimicrobial characteristics thereof. However, in a condenser, a coating thicknesses above about 500 microns, can adversely affect the heat transferability, of the heat transfer surfaces, due to plugging and prevention of water flow. Coating thicknesses less than about 100 microns, may decrease the life of the coating, since the coating slowly dissolves into the water. Accordingly for the coating on heat transfer surfaces, formed by the flow through method, the coating thickness typically ranges from about 100 to 500 microns.

See the paragraph bridging columns 6 and 7.

Appellants submit that the above-quoted disclosure makes it clear that thin coatings are not acceptable because they dissolve in water (i.e., a material that may be present in the refrigerant of the presently claimed invention). Appellants further submit that thick coatings are not compatible with micro heat-transfer devices and thus those of skill in the art would not have any expectation in successfully making a micro heat-transport device based on the combined disclosures of the Kirshberg and Steele art (e.g., making a micro heat-transport device using the thick coating of Steel in the device of Kirshberg).

Appellants again draw the Board's attention to dependent Claims 49 and 51 which recite particular dimensions of the condenser and wick, respectively. Appellants submit that the Steele coating would not lead one of ordinary skill in the art to the subject matter of Claim 51. For example, the hydrophilic coating of Steele must include inorganic particles which are disclosed to have a particle size that may range from 6 to about 14 μm (column 4, lines 7-10). The use of such a slurry in a micro heat-transport device is necessarily impossible because (1) the thickness of the resulting coating is incompatible with other components of the micro heat-transport device recited in Claims 49 and 51 and (2) the size of the individual particles is also incompatible with the dimensions of the underlying components of the heat-

transport device. For example, Claim 49 recites a condenser having a depth of about 200 μm. Including a coating having a thickness of 100 μm in such a condenser would fill the condenser and thus render it entirely useless. The same may be said for the wick of Claim 51 which has a dimension of about 100 μm. The inclusion of a 100 μm thick film would necessarily clog the wick. Further, the grooves of the wick of Claim 51 have a width of about 30 μm. Clearly, the inclusion of a coating having particles with a particle size of about 10 μm would clog or substantially restrict flow through the grooves. Those of ordinary skill in the art would thus have no expectation that the hydrophilic coating of Steele would be effective for a micro heat-transport device.

Appellants further draw the Board's attention to Claim 53 which recites a stable material present in the form of a layer "consisting of" SiO_2. Appellants submit that Claim 53 is further patentable over Steele for the reason that the Steele hydrophilic coating requires the inclusion of materials other than SiO_2. Steele discloses for example:

> The adhesive agent used in the binder actually provides the structural integrity to the coating by binding the coating together and preventing flaking and cracking.

See column 4, lines 18-21.

The above-quoted disclosure of Steele makes it clear that the Steele hydrophilic coating cannot consist of only SiO_2. Instead, the coating of Steele must include other ingredients such as an adhesive agent. Such additional ingredients are excluded from the presently claimed invention because Claim 53 requires the presence of a layer that contains only SiO_2. Appellants submit that it is a well-established legal principle that the transitional phrase "consisting of" signals closed claim language and thus the layer recited in Claim 53 must be a layer that contains only SiO_2.

Thus, Appellants submit that the combination of Steele and Kirshberg is not supportable because (i) Kirshberg and Steele describe devices having entirely different

dimensional characteristics, e.g., a macro device (i.e., Steele) versus the claimed micro device, (ii) one of ordinary skill in the art would have no expectation of success when using the hydrophilic coating of Steele in a micro device because the inorganic particles of the Steele hydrophilic coating are clearly incompatible with the dimensional requirements of a micro heat-transport device, (iii) the subject matter of Claim 53 is further patentable in view of Steele because the Steele hydrophilic coating must include components that are expressly excluded from the stable material of Claim 53.

For the reasons stated above, Appellants submit that the rejections of the present claims as obvious over a combination of Kirshberg and Steele are not supportable and should be overturned.

C. The Original Specification Discloses a Heat-Transport Device Having an Evaporator Formed Between a First Glass and a First Substrate and a Condenser Formed Between a Second Glass and a Second Substrate and Therefore the Rejection of the Claims for Failing to Comply With the Written Description Requirement Should be Withdrawn.

The Advisory Action of May 9, 2008 describes the rejection of the claims under 35 U.S.C. §112, first paragraph as follows:

> The Examiner does not object to the existence of a "plurality of substrates," rather a pair of substrates, such that a glass to glass structure is formed. As disclosed, the bonded substrates will comprise a glass to silicon structure.

See the first full paragraph of the continuation sheet of the May 9, 2008 Advisory Action.

From the above quoted description of the rejection as put forth by the Office, it is understood that the Office is of the belief that the original specification does not provide sufficient written description of a device having two bonded glass substrates.

Appellants submit that the original specification discloses a structure having bonded substrates, for example (underlining added):

> In any structure having a main body including a plurality of substrates bonded together, grooves constituting

> lines and microscopic asperities constituting the wick are formed in any one of the substrates.
>
> For example, in a structure where a silicon substrate and a glass (heat resistant glass) substrate are bonded, as described above, operation of a heat-transport device, using water as a working fluid, may cause the area of the silicon substrate where the wick in the evaporator and the lines are formed to discolor, and trace gas is generated.

See the paragraph bridging pages 7 and 8 of the specification.

Further, the substrate may be "silicon or glass":

> According to a fifth aspect of the invention, the bonding of the components or substrates where the base material is <u>silicon or glass</u> (heat-resistant glass or the like) decreases the effects caused by the gas.

See page 4, second full paragraph of the specification.

Appellants thus submit that the original specification clearly describes embodiments where the base material is silicon or glass and further describes embodiments in which two substrate materials are present. Appellants submit that those of ordinary skill in the art would readily recognize that the inventors were in possession of embodiments in which two substrates are present where the substrates may be either glass or silicon.

Appellants request the Board overturn the rejections under 35 U.S.C. §112, first paragraph.

For the reasons discussed above in detail, Appellants respectfully request the Board overturn the rejections and compel the Office to allow the now-rejected claims.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

Claims 1-10 (Canceled).

Claim 11. A micro heat-transport device comprising:

a refrigerant;

an evaporator formed between a first glass and a first substrate;

a condenser formed between a second glass and a second substrate;

wherein the first and second substrates are at least one of a glass substrate and a silicon substrate;

a liquid passage linking the evaporator and condenser configured to allow the refrigerant to flow from the condenser to the evaporator;

a gas passage linking the evaporator and condenser configured to allow the refrigerant to flow from the evaporator to the condenser; and

a wick being included in one of the evaporator, the condenser, the liquid passage, or the gas passage, wherein the at least one of first and second glass and/or the at least one of first and second substrate are covered with a stable material selected from the group consisting of SiO_2, SiN, SiC and a combination thereof formed by at least one of nitriding, oxidation, chemical vapor deposition, ion implantation, and carbonization.

Claim 12. A heat-transport device according to Claim 11, wherein the first and second substrates are Si.

Claim 13 (Canceled).

Claim 14. A heat-transport device according to Claim 11, wherein the refrigerant is a material including hydrogen.

Claim 15. A heat-transport device according to Claim 11, wherein the wick is covered with the stable material.

Claim 16. A heat-transport device according to Claim 11, wherein **the the** first glass and the first substrate and/or the second glass and the second substrate are bonded to one another by anodic bonding.

Claim 17. A method for manufacturing a micro heat-transport device, the method comprising:

forming an evaporator between a first glass and a first substrate;

forming a condenser between a second glass and a second substrate;

forming a liquid passage and a gas passage between the evaporator and condenser;

forming a wick being in one of the evaporator, the condenser, the liquid passage, or the gas passage; and

coating the first and second glass and/or the first and second substrate with a stable material selected from the group consisting of SiO_2, SiN, SiC and a combination thereof by at least one of nitriding, oxidation, chemical vapor deposition, ion implantation, and carbonization.

Claim 18. The method of Claim 17, wherein the first and second substrates are Si.

Claim 19 (Canceled).

Claim 20. The method of Claim 17, wherein the refrigerant is a material including hydrogen atom.

Claim 21. The method of Claim 17, wherein the wick is covered with the stable material.

Claim 22. A method of Claim 17, wherein the first glass and the first substrate and/or the second glass and the second substrate are bonded to one another by anodic bonding.

Claims 23-24 (Canceled).

Claim 25. The heat-transport device according to Claim 11, wherein the wick is ion implanted.

Claim 26. The method of Claim 17, further comprising:

coating the wick by ion implantation.

Claim 27. The heat-transport device according to Claim 11, wherein the wick is in the form of at least one of grooves, a screen and a sintered metal.

Claim 28. The method of Claim 17, wherein the wick is in the form of at least one of grooves, a screen and a sintered metal.

Claim 29. The heat-transport device according to Claim 11, wherein the refrigerant is at least one selected from the group consisting of water, ethyl alcohol, methyl alcohol, propyl alcohol, ethyl ether, ethylene glycol, Fluorinert and ammonia.

Claim 30. The method of Claim 17, wherein the coating comprises dry etching to form grooves or asperities; then

surface treating by at least one of ion implantation, thermal oxidation and steam oxidation; then

polishing by dry etching or plasma treatment; then

polishing by dry etching including covering with a mask an ion implantation; then

forming a thin film by vapor deposition; then

anodic bonding.

Claim 31. The heat-transport device of Claim 11, wherein the stable material is in contact with at least one of the glass and the substrate.

Claim 32. The heat-transport device of Claim 11, wherein the stable material is between the glass and the refrigerant.

Claim 33 (Canceled).

Claim 34. The method of Claim 17, wherein the coating coats the stable material directly on at least one of the glass and the substrate.

Claim 35 (Canceled).

Claim 36. The heat-transport device according to Claim 11, wherein the stable material is formed by chemical vapor deposition.

Claim 37. The method according to Claim 17, wherein the coating is chemical vapor deposition.

Claim 38. The heat-transport device according to Claim 11, wherein the stable material blocks the migration of an alkaline component from the glass and/or substrate into the refrigerant.

Claim 39. The method according to Claim 17, wherein coating the glass and/or the substrate blocks the migration of an alkaline component into the refrigerant.

Claim 40. The heat-transport device according to Claim 11, wherein the stable material blocks gas generation from the refrigerant.

Claim 41. The method according to Claim 17, wherein coating the glass and/or the substrate forms a stable material that blocks gas generation from the refrigerant.

Claim 42. The heat-transport device according to Claim 11, wherein the stable material is SiN.

Claim 43. The heat-transport device according to Claim 11, wherein the stable material is SiC.

Claim 44. The heat-transport device according to Claim 11, wherein the stable material is SiO_2.

Claim 45. The method of Claim 17, wherein the stable material is SiN.

Claim 46. The method of Claim 17, wherein the stable material is SiC.

Claim 47. The method of Claim 17, wherein the stable material is SiO_2.

Claim 48. The micro heat-transport device according to Claim 11, which has a capillary pumped loop structure.

Claim 49. The micro heat-transport device according to Claim 11, wherein the condenser is formed in the substrate and has a depth of about 200 μm.

Claim 50. The method of Claim 17, wherein the condenser is formed in the second substrate and has a depth of about 200 μm.

Claim 51. The micro heat-transport device according to Claim 11, wherein the wick comprises grooves having a width of about 30 μm and a depth of about 100 μm.

Claim 52. The method of Claim 17, wherein forming the wick includes forming grooves each having a width of about 30 μm and a depth of about 100 μm.

Claim 53. The micro heat-transport device according to Claim 11, wherein the stable material is present in the form of a layer consisting of SiO_2.

Claim 54. The method of Claim 17, wherein the coating forms a layer consisting of SiO_2.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None